IMPERIAL
DEPARTMENT OF AGRICULTURE
FOR THE WEST INDIES.

REPORT

ON THE

BOTANIC STATION,

AND

EXPERIMENT PLOTS,

ANTIGUA.

1912-13.

BARBADOS :
ISSUED BY THE IMPERIAL COMMISSIONER OF AGRICULTURE
FOR THE WEST INDIES.

1913.

[Price Sixpence.]

C. 21. IX. 14.

REPORTS

ON THE

BOTANIC STATION, ECONOMIC PLOTS AND AGRICULTURAL EDUCATION, ANTIGUA.

Annual Reports on Certain Economic Experiments conducted in connexion with the Botanic Station, 1900-2.

Annual Reports on the Botanic Station for the years 1901 and 1902.

Annual Reports on the Botanic Station, Economic Experiments and Agricultural Education for the years 1902-12.

SUGAR-CANE EXPERIMENTS.

IN BARBADOS.

Report of the Agricultural Work for 1900 :—
Manurial Experiments and Experiments with varieties of Sugar-cane.

Report of the Agricultural Work for the seasons 1899-1901 to 1908-10.
Parts I and II ; Manurial Experiments. Part III ; Varieties of Sugar-cane.

IN THE LEEWARD ISLANDS.

Report on Experiments conducted with Sugar-canes in the season 1899-1900.

Reports on Experiments conducted with Sugar-canes in the seasons 1900-1 to 1909-10.

Part I ; Varieties of Sugar-cane. Part II ; Manurial Experiments.

Sugar-cane Experiments in the Leeward Islands, 1911-12 and 1912-13.

Parts I and II published together in Royal 8vo.

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LETTER OF TRANSMITTAL.

Commissioner of Agriculture—to Colonial Secretary, Antigua.

No. A. 769.

Barbados,
March 7, 1914.

Sir,

I have the honour to forward herewith the Report on the Botanic Station and Experiment Plots, Antigua, for the year ending March 31, 1913.

2. Another year of dry weather has to be recorded, the precipitation during 1912 having been, with the exception of that of 1903, the lowest since 1875.

3. The unfavourable climate conditions necessitated a considerable amount of extra work and attention. As regards the Botanic Gardens, the suitability of succulents has been unavoidably demonstrated, and the Gardens now possess a collection of these drought-resisting plants which is probably second to none in the West Indies.

4. The work in the nurseries, as measured by the number of economic plants distributed, has increased during the year under review, the number sent out being some 22,000 more than in the previous year. They consisted principally of sugar-cane cuttings, lime plants, coco-nuts, Eucalyptus seedlings, sweet potato cuttings and onion plants and seeds.

5. The plot experiments, for the most part, have been intimately connected with the colony's minor industries, being conducted with provision crops and cotton. The extensive experimentation with varieties of sugar-cane is dealt with in a separate report to be issued shortly.

6. As regards the trials with provision crops, attention may be called to the result that no advantage accrues from planting sweet potatos from setts; that continuous cultivation does not sensibly alter the prussic acid content of cassava varieties; that satisfactory yields cannot generally speaking be obtained with tannias in Antigua, though with yams the reverse is the case. Concerning sweet potatoes, experiments have indicated that useful results will probably be obtained by selection based on the weight of roots of individual plants.

7. The routine selection work with cotton has been continued, but some difficulties were experience owing to the dry weather. Germination was poor and the leaf-blister mite appeared. The results of a large amount of work with cotton is described under the section headed Special Investigation Work. The hybridization results are especially interesting. It is hoped to fix a type having length of lint and resistance to leaf-blister mite (*Eriophes gossypii*). This line of work will be closely followed in other cotton-growing islands, besides Antigua.

8. Work connected with the control of pests and diseases is described under crop headings in a special section. Root disease is the principal enemy of the sugar-cane. Cotton has been rather severely troubled with leaf-blister mite and by the cotton worm. It is satisfactory to report that little harm was done by what has hitherto been the most serious pest of cotton in Antigua—the flower-bud maggot (*Contarinia gossypii*). Its disappearance has in all probability been occasioned by the discontinuation of cotton growing in certain districts, and by systematic effort to plant as early as possible, rather than by the work of insect parasites as stated in the report. Scale insects continue to affect limes, and a new pest of this crop has during the year come into prominence—the lime-twig girdler (*Elaphidion mite.*) This latter trouble has been satisfactorily dealt with by following the advice given by the Entomologist on the staff of this Department.

9. Turning to the section dealing with progress in the chief industries, it will be seen that the area under cotton increased by 367 acres, compared with the area under this crop in 1911-12. There was 154,430 lb. of lint reaped, which gives an average return of 197 lb. of lint per acre. The total value of the lint shipped was between £10,000 and £11,000. On the whole it may be said that the cotton season under review was very satisfactory.

10. The sugar-cane yields were limited through root disease and dry weather. The total quantity of sugar exported from the island for the year was 11,690 tons, made up of 7,503 tons of 96° crystals, and 4,187 tons of muscovado. This shows, however, an improvement on the output for 1911-12, but it is still over 1000 tons below the exports for 1907 and 1908.

11. The report concludes with various matters of more local than general interest. A very successful agricultural show was held during 1913, and considerable amount of work of a satisfactory nature was done in regard to the Reading Courses Examinations conducted by this Department. The Cadet system continues to progress satisfactorily in Antigua.

12. In conclusion, I have to express my appreciation of the way in which the duties described in this report have been carried out, and I feel sure that careful perusal of the details of the subject-matter will prove both useful and instructive to all those who may be interested in the agriculture of the Colony.

I have, etc,

FRANCIS WATTS,

Commissioner of Agriculture
for the West Indies.

REPORT ON THE BOTANIC STATION AND EXPERIMENT PLOTS, ANTIGUA,

For the Year ending March 31, 1913.

WORK IN THE GARDENS AND OBSERVATIONS ON PLANTS.

The work in the gardens was again retarded on account of drought; the year was one of marked dryness, the precipitation for 1912 being the lowest, with the exception of that for 1903, since 1875. A season of a nature similar to this following two of sparse rainfall caused the Gardens to present a somewhat ragged appearence during the greater part of the time under report. During the month of October and November, however, after fair rains had fallen, a successful effort was made to re-arrange existing trees, shrubs, etc., as well as to plant out fresh specimens. The disappearance, due to drought, of the avenue of royal palms left the western lawn extremely bare. The appearance of this was greatly improved by the planting of Cycads, small groups of palms, etc., and it is pleasing to report at the time of writing (June 1913), that the general appearance of the Gardens is probably better than it has been for some considerable time.

During several months of the year the water for the use of the Station had to be carted a distance by road of nearly a mile. This unforeseen event depleted votes and generally handicapped work.

About 30 per cent. of the plants growing in the conservatory died in consequence of the lack of water; little or no watering was done to plants in the Garden that were only of decorative value: efforts were concentrated on the preservation of those of direct economic use.

After the drought had broken, the demand for decorative plants from the householders in St. John's was considerably larger than the supply.

The attempt to meet this further depleted the stock in the Gardens, in consequence of which the appearance of the conservatory where most of the ornamental plants are grown leaves much to be desired.

During the year, the work of converting the ornamental border around the summer house into one containing succulents only, was completed. Previous to the commencement of this operation this border contained ornamental annuals and perennials, the appearance of which, during some parts of the season similar to those recently experienced, was decidedly bare.

The border is about 225 feet long and roughly in the shape of two semi-circles, and is backed by a dwarf bread-and-cheese hedge. There are a number of plants in it the appearance of which are striking and worthy of note. Among these may be mentioned *Opuntia robusta*, some of the so-called leaves being almost perfectly round and about 18 inches in diameter; they are from 1 to 1½ inches in thickness and are of a light green colour. These are armed with strong white spines, which are formed in clusters consisting of from two to seven. *Opuntia Ficus-Indica*, the Indian fig, is also sufficiently distinct to merit notice. The leaves, except in the younger stages, are unarmed; they are of a spreading habit, and the number of yellowish red flowers which commonly cover the tips impart a distinctness difficult to describe.

There is also growing here a specimen of *Furcraea medio-picta*. This plant is by far the most ornamental member of this genus known to the writer; its variegated leaves possess white mid-ribs bordered by stripes bluish grey in

colour, and between these and the outer light-green edges of the leaves there are two corresponding bands of white. It was received from the local Agricultural Department, Barbados, some four years ago; since then its growth has been slow, but its general appearance has always been healthy. Of the aloes there are two worthy of note: *Aloe abyssinica* and *A. Xanthostachys*. The former is a handsome species, the leaves of which, like those of most aloes, form a rosette; they are about 2 feet long and taper from 6 to 8 inches to a rather fine point; they are armed along the margins with rather sharp spines; their colour is green, blotched with white. This plant flowers annually, the blossoms being borne on a long gracefully branched peduncle which sometimes attains a height of 3 feet. The latter, *Aloe Xanthostachys*, is a somewhat dwarf plant; it is distinct in that the leaves, which are of a light green colour are armed both on the margins and backs, there being usually four rows of spines on each leaf. *Dyckia rariflora* is an elegant little plant also worthy of notice. It possesses narrow lanceolate greyish-green leaves, the margins of which have distinct spines: this small Bromeliad was imported during the year. Among other plants growing on this border there are the handsome Agaves, *atrovirens* and *americana*, var. *variegata*; there is also a somewhat rare plant, i.e. *Aloephorbia arborescens*. Two plants of this were received from Kew about ten years ago; one specimen has attained the height of about 14 feet; the greater part of its stem is bare, there being but a crown of about five branches which are covered with somewhat leathery dark-green leaves. There are also numerous other interesting succulents growing in this border. Probably as these develop further, notes will be made on them and published in later reports.

For several years the question of destroying a large Pandanus hedge growing on the south-west boundary of the Gardens has been considered. It had attained a height of some 20 feet, and although an acknowledged eyesore on account of its irregularity and lack of undergrowth, its utility as a wind-break had to be considered. After due thought, it was decided that its usefulness was, on account of its position, possibly less than imagined, and early in the season it was removed. In its stead a Bougainvillea hedge was planted, and although this is making but slow growth, due to the abnormal weather experienced, it will po-sibly in a few year's time greatly add to the beauty of the part in which it is established.

The three years' drought just experienced has taught many severe lessons to the officers working in this Station. It has demonstrated how futile it is to attempt to grow many plants in wind-swept situations during dry weather, and how well adapted certain xerophytes are for such positions. The manner in which some plants recovered and made growth after rain fell proved what marvellous recuperative powers they possess, and bears testimony to the fertility of tropical soils even when of such a poor nature as those possessed by the Botanic Garden in Antigua.

As foreshadowed in last year's report, the nurseries at the Botanic Station were remodelled and enlarged. Previous to the commencement of this work the nurseries were partly open, partly shaded by a bamboo and other trees, the nursery shade for the remainder being provided by palm branches. The whole of the area occupied by these was enclosed with a neat trellis-work fence; the trees were removed and overhead shade for a part provided by laths. Unfortunately the money voted was not sufficient similarly to cover the remaining space. It is hoped that the work will be completed during the coming year. Neat walks, beds for plants, and a propagating border were made; these were all bounded by small concrete blocks which give a finished effect to the whole; the beds and walks all received a covering of fine gravel.

Owing to the increased demand for such plants as Eucalyptus, which require protection from the sun when young, a lath house was erected in which to grow these until sufficiently old to stand the effects of hot sunshine. This was erected in the space occupied some time ago by the Apiary. The laths are spaced about their width apart, and it would seem that the difficulties experienced in raising Eucalyptus in Antigua will be considerably minimized by the use of such a building.

The floors of the tool room, harne-s room and watchman's room were concreted. Previous to this, these possessed earthern floors which, especially in wet weather, were extremely difficult to keep clean.

The yard received a good foundation of metal on which was placed fine grit. Since the erection of the oil engine and mill at the Botanic Station a fairly

large number of heavy estate carts enter into this part of the Garden. These bring in, for crushing and subsequent analysis, the samples of various varieties of cane grown on the Experiment Plots ; in addition, carts also enter to obtain plants, etc. To prevent the formation of holes and general untidiness, this work became necessary and was carried out early in the year.

Neat wooden railings with gates were erected around the compost heap. The formation of compost heaps is a necessary evil in any garden, but their appearance is as a rule anything but beautiful, and the enclosing of the one in question is a great improvement to that part of the garden in which it is situated.

Work in the Nurseries and Distribution of Plants.

WORK IN THE NURSERIES.

As will be inferred from the preceding pages of this report, great difficulty was experienced in keeping alive the stock of nursery plants during the drought.

Use was made of the new lime nursery during the year. This is situated at Scotts Hill, a few yards from a public pond from which water is brought into the plot by a rotary pump. During the early part of the year the water was used in helping to establish the young seedlings, but during the latter end of June this source gave out. About this time the young plants were fairly well established, and from then until the drought broke, water was carried a distance of ¾ mile ; the supply was strictly limited, but judicious use of what was available tided the plants over the trying period.

The orders that were received for coco-nuts and limes were executed, but it was found impossible to attempt to carry out those for Eucalyptus. Seeds of these plants matured in June and July, and at this time great difficulty was experienced in keeping alive the existing nursery stock, and it would have been foolish policy to have added to it. The extension of the nurseries will, it is hoped, greatly facilitate this work during the coming year.

DISTRIBUTION OF PLANTS.

The following is a list of the plants and seeds sent out during the year :—

Limes	43,818
Coco-nuts	3,739
Eucalyptus rostrata	1,417
Mahogany	815
Miscellaneous forest trees	620
„ economic plants	774
„ ornamental „	114
„ palms, etc.	74
	51,371
Onion plants	6,000
Cane „	138,298
Total	195,669

The following seeds and cuttings were also distributed during the year :—

CUTTINGS.

Sweet potato	106,700
Cassava	300
Miscellaneous	250
Total	107,350

SEEDS.

Onion	399½lb.
Miscellaneous 74 packets, 38lb., 2 gallons, 1 box, 2 bags.	
Eddoe	144lb.
Yam	

Of the above 170lb. of onion seeds were sent to St. Kitts, Montserrat and the Virgin Islands.

The number of plants sent out during the year, apart from the onion and cane plants, is the largest recorded since the Station was opened. The number of lime plants distributed during the year was sufficient to plant roughly 220 acres, and the coco-nuts about 80. Eucalyptus, mahogany and miscellaneous forest trees to the number of approximately 3,000 were sent out. This latter number is much smaller than was anticipated and was entirely due to the scarcity of water.

The following table gives the annual distribution of plants from the Botanic Station since 1900, and indicates the manner in which this work has steadily increased :—

Year.	No. of plants distributed.
1900-1	2,138
1901-2	6,465
1902-3	2,961
1903-4	3,140
1904-5	4,465
1905-6	2,561
1906-7	2,880
1907-8	14,522
1908-9	7,256
1909-10	17,139
1910-11	18,260
1911-12	29,196
1912-13	51,371.

During the years 1904-6, 13,000 plants were raised in addition to those mentioned above and planted in the reforestation plots. Previous to 1908-9, only a limited number of cane plants were distributed annually. In the following table the numbers of cane and onion plants sent out since this date are given :—

Year.	Cane plants.	Onion plants.
1908-9	71,000	.....
1909-10	157,557	6,000
1910-11	46,087	1,400
1911-12	180,810	11,700
1912-13	138,298	6,000

These figures indicate strikingly the way in which the nursery work has assumed an important position in the routine work of this Department.

The distribution of more than half a million cane plants since 1908 must have had a considerable effect on the staple industry of the island.

Onion plants are primarily grown for peasants who cannot afford to advance money to pay for seeds. The cost of these depends on the manner in which the seeds germinate, but it usually works out at less than a shilling per thousand plants.

It will be seen that again large quantities of sweet potato cuttings were sent out. That the free distribution of these is being more appreciated accounts somewhat for the fact that 200,000 have been sent out during the last two years ; but it must also be mentioned that planting material was, on account of the two excessively dry seasons experienced, extremely scarce.

Apart from the unfulfilled orders for Eucalyptus there are fairly large orders for Bay trees, miscellaneous forest and fruit trees, etc., and it does not appear as though the nursery work in Antigua will decrease for some considerable time.

PLANT IMPORTATION.

Further efforts were made during the year to improve the collection of Eucalyptus growing in these Gardens, and the following species have been added since the last report was written :—

Common name.	Botanical name.
... ...	*Eucalyptus alba*
... ...	,, *Cosmophylla*
... ...	,, *dealbata*
Red ironbark	,, *paniculata*
... ...	,, *Maideni*
Flooded gum	,, *saligna*
Mountain ash	,, *Sieberiana*
... ...	,, sp.
... ...	,, *stellulata*
Moreton Bay ash	,, *tessalaris*
Manna gum	,, *viminalis*

The growth made by those imported last year, as might be expected, varied greatly. That made by *Eucalyptus tereticornis, E. odorata, E. patentinervis, E. intertexta,* and *E. affinis* was good ; that made by *E. Bridgesiana, E. Cambagei, E. ehemia, E. pulverulenta* and *E. sideroxylon* was fair, and that made by *E. Morrisii* and *E. Smithii* indifferent. Unfortunately the drought proved too much for *E. hemiphloia, E. leucoxylon, E. meliodora, E. umbra* and *E. paniculata.* The latter, however, was re-imported during the year. The Antigua collection of Eucalyptus now consists of twenty-seven different species. At the present time reliable local knowledge as regards only a few of these has been obtained ; of the newer kinds it would however seem that *E. tereticornis, E. patentinervis* and *E. intertexta* will prove adapted to local conditions ; and as the value of the lumber yielded by *E. tereticornis* is known, it is probable that it will prove a valuable addition to the plants of Antigua. Since it was planted, some twelve months ago, this tree has made between 5 and 6 feet of growth, which is extremely good when the climatic conditions experienced during the time are taken into account.

The interesting plant, *Ficus religiosa,* imported last year, is now established, although making but slow growth. In India this tree is held in great veneration, and probably the sacred Bo tree growing at Anuradhapura in Ceylon is the oldest tree of which there is any record in the world. It is supposed to have been planted more than 200 years before the birth of Christ.

Other new plants successfully imported during the year are : *Morus alba, Melocanna bambusiodes, Cereus eriphorus, Cereus Huotti, Kleinia articulata, Dyckia altissima, Dyckia rariflora, Aloe borziana, A. Xanthostachys, A. Hilderabrantii, A. Thraskii, Agave densiflora. A. attentuata, A. horrida, A. maculata, A. micrantha, A. celsiana,* var. *nana, A. bractrosa, A. milleri,* var. *variegatha, Opuntia haematocarpa, O. sulphurea, O. streptacantha, O. tomentosa, O. texana, O. glaucophylla, Gasteria verrucosa, G. mullipunctata, Kalanchoe Kirkii, Portulacaria afra, Mamillaria stellata,* var. *texana, Furcraea Bedinghausii, Cotyledon scheidecerii, Leythis zabucajo, Juniperus barbadensis.*

A glance at the above list will show that most of the importations consisted of succulent plants ; these were all received from the Royal Botanic Gardens, Kew. The Botanic Station in Antigua is peculiarly adapted to the cultivation of these xerophytes, and it possesses a collection of succulents probably second to none in the West Indies.

Contribution of plants and seeds were received during the year from the following :—

The Imperial Commissioner of Agriculture, the Royal Botanic Gardens, Kew ; the Botanic Stations at Dominica, St. Lucia, Grenada, Montserrat, St. Vincent, St. Kitts ; the Agricultural Departments of Trinidad and Jamaica ; the local Department of Agriculture, Barbados ; the Royal Botanic Gardens, Calcutta ; and locally from His Excellency the Governor, Mr. H A. Tempany, Mrs. Tough and others.

Plants and seeds were sent to the Royal Botanic Gardens, Kew ; the Botanic Stations at Tortola, St. Kitts, Montserrat, Dominica, St. Lucia, St. Vincent and Grenada ; the Agricultural Departments at Trinidad and St. Croix, and locally to Government House, the Hospital, the Lunatic Aslyum, etc.

Plot Experiments at the Botanic and Experiment Stations.

The majority of the plot experiments intimately connected with the minor industries of the island are conducted at Skerretts Experiment Station. These consist in the main of the testing of varieties of various ground provisions, the raising of new varieties of cotton, etc., as well as various experiments in connexion with the selection of cotton, ground provisions, etc. Sugar-cane variety and manurial experiments are conducted on ten different estates situated in various parts of the island. The results obtained from these are embodied in a separate report.

Sweet Potatoes.

Trials were again made with sweet potato varieties, the one under review being the thirteenth consecutive trial made with many of them. The distribution of large quantities of planting material from the nursery plots containing these varieties indicates the usefulness of these experiments. During the period under report more than 100,000 cuttings were sent out for planting purposes.

Two plots of sweet potatoes were planted on September 10, one with setts and the other from cuttings in the ordinary manner. The plots were reaped on February 3. The following table gives the results. The area in each variety was $\frac{1}{160}$-acre :—

Variety.	Yield per plot planted with cuttings in lb.	Yield per plot planted with setts in lb.	Gain or loss per plot planted with setts in lb.	Average yield per plot in lb.
Antigua Cross	9	16	+ 7	12·5
Black Vine	20	16	− 4	18·0
Ship Rock	18	29	+11	18·5
Montserrat Mamma	15	11	− 4	13·0
Hen and Chickens	23	20	+ 3	21·5
White Gilkes	16	11	− 5	13·5
T. 2	14	29	+15	21·5
Spooner	26	20	− 6	23·0
T. 3	22	14	− 8	18·0
Elijah	12	16	+ 4	14·0
T. 4	15	15	...	15·0
T. 1	20	15	− 5	17·5
Quildon	15	17	+ 2	16·0
Caroline Lee	30	18	−12	24·0
Gent's Table	8	16	+ 8	12·0
Harper	16	24	+ 8	20·0
Annie	15	16	+ 1	15·5
Barbados Barrel	14	20	+ 6	17·0
Bourbon	15	15	...	15·0
Anguilla	10	14	+ 4	12·0
Yellow Red	10	15	+ 5	12·5
Vincelonia	11	20	+ 9	15·5
Jackass 1	...	20	...	...

This is the third occasion on which trials similar to the above have been made, and from these it would appear that little or nothing is to be gained by planting sweet potatoes from setts. Apart from the somewhat negative results obtained from these trials, the cost of planting a large area under this crop in such a manner would be a deterrent to a similar method becoming general.

The following table gives the yields from the experiments with sweet potato varieties since 1900-1, including the returns for the year 1912-13 :—

Average yield of sweet potato for thirteen years in lb.

Variety.	1900-1.	1901-2.	1902-3.	1903-4.	1904-5.	1905-6.	1906-7.	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	Average for 12 years.
Hen and Chickens ...	30	77	33	50	60	44	42	60	33	70	70	60	43	52
T. 1 ...	59	86	46	46	35	44	41	38	18	64	85	40	35	49
Barbados Barrel ...	...	55	23	61	50	15	40	34	36	95	70	49	34	47
T. 2 ...	52	73	40	47	45	41	35	32	23	60	50	68	43	47
Spooner ...	58	92	23	38	44	30	48	38	37	35	59	55	46	46
T. 4 ...	55	64	36	47	47	44	50	39	22	54	50	37	30	44
Elijah ...	63	65	43	53	50	20	37	27	35	55	35	30	28	42
Harper ...	42	91	24	53	50	20	30	19	37	34	70	37	40	42
Bourbon ...	...	81	28	40	40	10	45	30	28	35	55	38	30	38
Anguilla ...	40	56	32	36	35	12	34	25	36	50	44	45	24	36
Blue Bell ...	38	43	19	30	34	10	40	22	39	25	45	37	28	32
T. 3 ...	29	40	21	19	29	35	27	32	16	43	39	42	36	31
Caroline Lee ...	30	17	36	50	29	37	47	20	15	34	35	48	31
Annie ...	51	34	20	25	27	22	27	25	38	45	52	31	31	31
Quildon ...	31	16	27	19	36	35	20	27	17	40	40	55	32	30
Gent's Table	43	17	30	23	37	25	39	27	18	15	33	38	24	28

In the following table, the returns obtained from the varieties reported on last year for the first time are given :—

Variety.	Yield per plot in lb.	Calculated yield per acre in lb.
North, No. 1	20	3,200
Geranium	20	3,200
North, No. 4	16	2,560
Bett Weekes	15	2,400
North, No. 3	15	2,400
Silly	10	1,600
North, No. 2	10	1,600
Jim Gage	10	1,600

The returns from all these trials were extremely poor, which may be accounted for by the unpropitious weather experienced.

Cassava.

The trial of cassava varieties now under report is the seventh consecutive one made.

As mentioned in former reports, the cultivation of cassava in Antigua is in the hands of peasants, and only a limited quantity is grown, and it would seem that there is little likelihood of the area planted in this crop in the near future increasing to any appreciable extent. Cassava probably cannot be grown as cheaply here as in some parts of the world where it is grown as a catch crop through permanent plantings. It is however probable that a small trade with America or Great Britain could be worked up with cassava cakes or biscuits. The local cakes are crisp and possess a delicate flavour entirely their own, and if known in those countries would possibly in a short time become popular as an afternoon tea delicacy, etc.

Cassava is put on the market in the form of starch, chipped and sun-dried with peel or without peel; it is also grated, and even the refuse after the starch is extracted is saleable.

At the Experiment Station, Colombian, Montserrat and Jamaican varieties are grown.

The following tables give the results. All the varieties were planted on April 10 and reaped on February 10.

COLUMBIAN VARIETIES.

The following table gives the results obtained this year and during the previous seven years from the Columbian cassava :—

Variety.	Yield per plot in lb.	Calculated yield per acre in lb. 1912-13.	Calculated yield per acre in lb.						Average yield per acre for six years, lb.
			1906-7.	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	
Blancita ...	15	4,950	4,400	17,700	6,400	11,200	11,680	12,800	9,876
Negrita 12 ...	14	4,620	1,923	2,560	3,840	6,400	11,520	14,080	6,420
Pacho 4 ...	13	4,290	640	2,560	4,480	3,520	8,960	17,280	5,961
Helada 15 ...	12	3,960	960	3,200	3,840	4,160	12,164	14,400	6,098
Pacho 3 ...	11	3,630	1,600	1,440	4,800	...	11,040	16,000	6,818
Paloma ...	11	3,630	1,600	1,510	4,800	4,480	13,120	12,480	5,946
Negrita ...	10	3,300	2,080	3,680	3,840	4,160	7,680	13,440	5,454

An interesting note compiled by Mr. H. A. Tempany, Government Chemist and Superintendent of Agriculture for the Leeward Islands, will be found at the end of this section of the report, on the hydrocyanic acid content of the above cassava varieties.

MONTSERRAT VARIETIES.

The yields from the varieties originally received from Montserrat, for the year under report and the previous seven years are given in the following :—

Variety.	Yield per plot in lb.	Calculated yield in lb. 1912-13.	Calculated yield per acre in lb.							Average yield per acre for eight years in lb.
			1905-6.	1906-7.	1907-8.	1908-9.	1909-10.	1910-11.	1911-12	
Blue Top ...	34	11,220	1,600	2,240	10,080	6,720	6,7 20	9,920	11,200	7,462
Jackroe ...	32	10,560	800	5,440	8,640	4,800	3,840	14,520	10,880	7,435
Bitter ...	30	9,900	...	2,400	7,040	6,400	7,040	13,449	9,600	7,975
New Green	30	9,900	2,240	4,800	12,000	5,440	6,400	13,440	12,408	8,337
Blue Stick	28	9,240	...	...	3,320	8,000	6,080	13,440	...	8,016
Red Greenaway ...	24	7,920	1,280	6,080	13,120	6,400	7,680	14,520	4,800	7,725
French ...	16	5,200	1,440	6,400	11,840	5,440	8,640	12,800	5,120	7,120
White Greenaway	13	4,290	2,400	5,760	13,920	4,480	8,320	16,000	14,400	8,696
Rodney ...	10	3,300	800	8,000	8,340	4,160	7,360	12,160	12,480	7,075

JAMAICAN VARIETIES.

In the following table the yields from the Jamaican varieties are given :—

Variety.	Yield per plot in lb.	Calculated yield per acre in lb. 1912-13	Calculated yield per acre in lb.							Average yield per acre for eight years in lb.
			1905-6.	1906-7.	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	
Cotton Tree	...	...	2,560	640	11,680	6,080	9,280	16,000	14,400	8,663
Bobby Handsome	14	4,620	3,240	800	9,280	6,720	9,920	16,000	11,200	7,723
Mullings	26	8,580	3,200	800	10,400	9,920	11,200	14,080	11,200	8,673
White Top	...	...	...	3,128	8,960	3,840	19,880	13,400	15,680	10,815
Smallings	16	5,280	2,400	3,340	6,920	4,480	9,600	12,80 0	11,200	7,003
Yellow Belly	25	8,250	3,360	960	10,400	5,440	8,320	12,800	8,000	7,191
Silver Stick	15	4,950	2,400	5,120	10,560	5,120	7,360	12,460	...	6,853
White Stick	...	...	3,240	640	7,360	8,000	5,760	12,460	12,160	7,089
Brown Stick	...	...	...	800	11,040	8,000	10,560	10,880	10,880	8,693
Bunch of Keys	20	6,600	4,480	800	7,040	4,800	13,120	10,880	12,800	7,565
Blue Bud White.	30	9,900	2,880	646	10,240	6,080	10,240	12,820	9,600	7,558
Blue Bud Black.	20	6,600	3,040	3,680	13,120	5,440	4,800	9,920	16,000	7,825
Shuana Sweet	...	...	...	960	12,960	6,400	4,480	9,600	3,200	6,267

Of the above varieties six were lost during the year: this was due to the severe drought experienced. Efforts will be made to replace these.

It will be seen from the above tables that the returns from the cassava plots were poor. These also indicate that the yield from this crop fluctuates greatly. During the trials made immediately before those under report, in a season similar to the one just experienced, fairly good returns were obtained, the same holding good for several years; so that it would appear that, other things being equal, the controlling factor is not so much the total quantity of rain that falls during any given season but rather the manner in which it is distributed.

NOTE ON COLUMBIAN VARIETIES OF CASSAVA GROWN AT THE SKERRETTS EXPERIMENT STATION.

The chief characteristics of these Columbian cassavas which distinguish them from West Indian varieties is the low content of hydrocyanic acid which they possess.

Determinations have from time to time been made in the Government Laboratory for the Leeward Islands of the hydrocyanic acid content of the several varieties grown on the experiment plots at Skerretts with a view to ascertaining whether on continued cultivation under West Indian conditions this tends to increase. The results of two series of determinations made in 1907 and 1913, respectively, are summarized below.

Variety.	Year, 1907 Hydrocyanic acid per cent.	Year, 1913. Hydrocyanic acid per cent.
Blancita	·0049	·0043
Pacho 3	·0038	·0034
Pacho 4	...	·0015
Negrita 12	·0047	·0035
Negrita 15	...	·0046
Helada	·0038	·0028

The results are given in terms of percentage of hydrocyanic acid contained in the fresh root. For comparison it may be stated that similar determinations on West Indian bitter and sweet cassava show that they contain about ten times the amount of hydrocyanic acid determined in Columbian varieties.

The results quoted above appear to show that after six years' cultivation in Antigua, these varieties have not sensibly altered in respect of their contents of hydrocyanic acid. This fact combined with the very marked improvement in yield which has taken place during the past three years indicated that some at any rate of the varieties are worthy of careful attention.

EDDOES AND TANNIAS.

A $\frac{1}{10}$-acre plot was planted with ten varieties of eddoes and tannias. The land on which they were grown was cross-holed and manured.

Planting took place on May 20, and the crop harvested on March 15.

The results are given in the following table:—

Variety.	Area.	Weight of heads in lb.	Calculated weight per acre in lb.
Tannia Roliza	$\frac{1}{110}$	35	3,850
Red Eddoe	$\frac{1}{66}$	55	3,675
Tannia Priete	$\frac{1}{55}$	80	4,400
Tannia Baliza White	$\frac{1}{66}$	44	2,794
Tannia White	$\frac{1}{160}$	12	1,920
Tannia Islena	$\frac{1}{110}$	30	3,300
Tannia Yellow	$\frac{1}{80}$	41	3,280
Tannia Blanca	$\frac{1}{110}$	24	2,640
Eddoe Dasheen	$\frac{1}{160}$	5	800
Tannia Prolific	$\frac{1}{160}$	6	960

The weights of the heads reaped are not given in the above, but the total from the varieties was 365 lb. Tannia Dominica was lost during the year.

In the following table the weight per acre from each variety is given since the inception of these trials in 1908-9 :—

Variety.	Calculated weight of seed per acre in lb.					
	1908-9	1909-10	1910-11	1911-12	1912-13	Average for five years.
Tannia Priete	1,540	4,400	1,650	4,028	4,400	3,203
Tannia Yellow	4,840	8,140	2,035	3,392	3,280	4,337
Tannia Islena	1,650	2,200	3,135	3,710	3,300	2,799
Tannia Roliza	1,320	5,500	2,750	3,200	3,850	3,324
Red Eddoe	1,650	3,300	1,705	3,040	3,675	2,674
Tannia Baliza White ...	220	6,600	1,430	2,800	2,794	2,768
Tannia White	1,100	5,500	1,650	3,604	1,920	2,754
Tannia Blanca... ...	1,540	1,100	1,650	3,200	2,640	2,046
Eddoe Dasheen... ...	1,540	1,100		1,620	800	1,265
Tannia Prolific	2,310	550	3,740	640	961	1,640

The above table indicates that meagre returns were obtained from this crop during the last five years. The crop is always regarded as a somewhat uncertain one, and this fact is probably responsible for the small area planted annually in Antigua.

COTTON EXPERIMENTS.

During the period under review, and for several years previous to it, the cottons grown at the Experiment Station at Skerretts have been either Sea Island cottons for selection purposes, hybrid cottons, or in some few cases well-known short staple varieties.

The following is a list, exclusive of hybrid cottons, of the cottons grown during the year :—

No. or name of cotton.	Area grown in acres.	Yield per plot in lb.	Calculated yield of seed-cotton per acre, in lb.
No. $\frac{2}{1911}$	$\frac{1}{40}$	31	1,240
No. 230	$\frac{1}{30}$	40	1,200
No. $\frac{9}{1909}$	$\frac{1}{30}$	38	1,140
Heaton	$\frac{1}{30}$	32	960
Kent	$\frac{1}{30}$	30	900
No. 66	$\frac{1}{30}$	21	630
No. $\frac{4}{1911}$	$\frac{1}{30}$	20	600
No. $\frac{1}{1911}$	$\frac{1}{40}$	12	480

All of the cottons were planted on July 7, and the trees were destroyed on May 13. The germination resulting from the first planting was extremely poor, and the plots were practically replanted a month after the first operation.

Although decidedly better than the results obtained last year, the above returns cannot, on the whole, be considered as satisfactory. It must however be understood that the land on which this cotton was grown cannot be regarded as suitable for this crop.

The returns obtained from the first three of the selections in the above are, however, fairly good; those obtained from some of the others are decidedly poor.

Kent and Heaton cottons were originally received from Barbados; all the others are from Antigua selections.

On the whole, the cotton grown during the year at the Experiment Station was free from any serious insect attacks. Several attacks of caterpillars (*Alabama argillacea*) were experienced: these were controlled by the usual remedies. The flower-bud maggot (*Contarinia gossypii*) did but little damage, it being first noticed on the plots on January 11 about two months later than its appearance in the same place last year. As usual, leaf-blister mite (*Eriophyes gossypii*) was common on the plots at the latter end of the season.

In addition to the above, four varieties other than Sea Island were grown. The returns from these are given in the following table :—

	Area grown in acres.	Actual yield in lb.	Calculated yield of seed-cotton per acre, in lb.
Southern Cross	$\frac{1}{30}$	29	870
Sakellarides A	$\frac{1}{30}$	18	480
Sakellarides B	$\frac{1}{30}$	13	390
Thornton's Hybrid	$\frac{1}{30}$	15	450

A comparison of the above returns with those in the previous table shows results in favour of the Sea Island cottons. In last year's report a short description of these cottons was given.

YAMS.

Trials were again conducted during the year under review with eleven varieties of yams.

This makes the thirteenth consecutive trial, and the results obtained can be looked upon with a fair amount of confidence.

Yams are grown to a fairly large extent in Antigua, both on the estates and by small growers. It is, on the whole, a fairly reliable, lucrative crop. A comparatively small area was planted during the last year and some difficulty was experienced by growers in obtaining material for planting purposes.

This crop is grown in Antigua entirely for local consumption; popular taste inclines to the white rather than to the red yams, but both kinds sell readily. It is said that the latter keep better than the white, but their colour would probably militate against their obtaining popularity in countries where the crop is not cultivated.

Two $\frac{1}{10}$-acre plots were planted on May 22. One plot was unmanured and the other received manure at the rate of about 20 tons to the acre.

The area of land occupied by each variety was $\frac{1}{110}$-acre. The yams were reaped on February 10.

The results are given in the following table :—

Variety.	Yield from manured plot in lb.	Yield from unmanured plot in lb.	Gain or loss on manured plot in lb.	Average yield per plot in lb.	Remarks.
Oriental ...	120	60	+ 60	90	Shape good, white.
Danish ...	64	116	− 52	90	Medium size, white.
Crop ...	94	70	+ 24	82	Shape good, white.
Bugle Horn	84	66	+ 18	75	Shape crooked, white.
Sealed Top	75	70	+ 5	73	Large, white.
Light Red...	75	65	+ 10	70	Shape good, large, red.
Cush ...	81	40	+ 41	62	Medium sized, white.
Bottle Necked Lisbon	54	54	...	54	Good cooker, white.
Lisbon ...	70	30	+ 40	50	Shape variable, white.
Horn ...	25	25	...	25	Shape crooked white.
Cush Cush...	15	20	− 5	18	Small, white.

The above results are not particularly good, although much better than those obtained last year.

In the following table the results for thirteen years are given in pounds per plot :—

Variety.	1900-1.	1901-2.	1902-3.	1903-4.	1904-5.	1905-6.	1906-7.
Light Red ...	126	67	24	51	80	90	161
Sealed Top ...	83	54	23	47	61	37	87
Bottle Necked Lisbon ...	61	117	43	37	63	52	116
Cush Cush ...	42	127	39	29	34	22	73
Crop ...	45	46	30	24	61	85	58
Lisbon ...	91	97	50	29	60	40	62
Oriental ...	81	119	31	27	36	20	71
Bugle Horn ...	25	42	15	23	49	47	66
Danish ...	37	63	32	23	43	30	47
Horn ...	26	35	17	14	50	36	60
Cush ...	54	61	24	11	52	37	67

Variety.	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	Average.
Light Red ...	107	115	70	50	36	70	80
Sealed Top ...	116	135	110	64	47	73	70
Bottle Necked Lisbon ...	70	70	100	36	19	54	65
Cush Cush ...	117	87	74	74	36	18	60
Crop ...	65	70	172	42	35	82	62
Lisbon ...	37	80	75	37	19	50	56
Oriental ...	104	55	70	45	35	90	60
Bugle Horn ...	96	97	105	50	45	75	56
Danish ...	77	95	70	45	20	90	52
Horn ...	72	70	62	65	17	25	42
Cush ...	71	71	55	7	15	62	45

The yam varieties introduced through the medium of the Experiment Station are now in cultivation throughout the island. There is a fair demand every year for the produce from these plots for planting purposes.

Sesame (*Sesame indicum*).

A $\frac{1}{10}$-acre plot of this plant was sown on September 15, and reaping was completed on December 23; the return from this area was indifferent, it being 30 lb. of shelled seeds.

This crop, on the whole, has been free from insect pests during its trials on the experiment plots. Sesamum might possibly be useful to the peasants in Antigua, for it has been stated that the seeds when parched and eaten with sugar form a nourishing and palatable dish and that this can be crushed and mixed with other ingredients to form cakes and bread. A plant, the seeds of which can easily be transformed into a breakfast, and one that grows with little difficulty is worthy of trial, on a small scale at least, by the peasant class of the island. As stated in previous reports, the seeds of this plant yield a bland oil sometimes known as gingelly oil; it is used in domestic economy and for adulterating olive oil.

GREEN DRESSINGS.

It has again to be reported that the experiments conducted during the year under review with plants suitable for green dressing purposes were spoilt owing to the severe drought experienced.

Trials were made with cowpeas, Baricou bean, sword bean, *Cyamopsis psoraloides*, *Tephrosia candida*, *Clitoria tematea*, and others.

With the exception of the last two, all gave returns which, if recorded, would only be regarded as unreliable owing to the indifferent stands obtained in each case.

FODDER EXPERIMENTS.

Teosinte.

A $\frac{1}{30}$-acre plot of the above was planted broadcast on July 26. The crop was first cut on November 29, and 573 lb. of undried grass was obtained; it was allowed to ratoon and on April 3, when cut, the yield was 308 lb. Thus the yield per acre for the two reapings was at the rate of more than 26,000 lb. of fodder.

This plant has been grown on the experiment plots for a number of years and the returns obtained have as a rule been good. Its value is greatly due to its tillering power; it resembles corn in appearance but is more leafy.

As a rule the seeds are sown in drills when about 10 lb. are required to each acre of land.

Sainfoin.

An area similar in size to that planted in the above was sown on July 26. The germination of the seeds was indifferent; this probably was not due to the poorness of the planting material but rather to drought. The forage was reaped on April 9, when 181 lb. was obtained. It cannot be said that a return of 5,400 lb. of undried fodder per acre is sufficiently heavy to warrant planters and others to try it on a large scale.

This plant, however, has the reputation of being specially adapted to light chalky soil, which is a very different type to that on which it was grown.

Other fodder crops as Australian salt bush, Kaffir corn, and winter vetch, were tried but the seeds did not germinate.

Soy or Soja Bean (*Glycine hispida*).

A considerable amount of attention is at the present time being given to the growing of this crop in various parts of the world on account of the numerous uses to which the seed can be put. Trials with soy beans have been conducted on the experiment stations at Antigua for four consecutive years. In spite of general slight improvements in the appearance of the plants, it would seem, judging from the results obtained, that the local soil and other conditions are not suited to this crop.

Three varieties were planted on September 11; the area of land occupied by these was $\frac{1}{10}$-acre. Seeds were reaped on December 10.

The returns of shelled seeds were as follows :—

D.	...	...	... 7 lb.
Yellow	...	...	... 5 „
H.	...	...	... 4 „

The weights obtained are extremely poor. A return of 160 lb. of seeds per acre can in no way be regarded as remunerative. Experimental areas of considerable size have in the past been planted in Antigua. The results obtained have always been of a discouraging nature.

Ground Nuts (*Arachis hypogaea*).

A $\frac{1}{10}$-acre of two varieties of ground or pea nuts were planted on May 16.

The following gives the return from each :—

Carolina Running	—	—	— 65 lb.
Spanish	—	—	— 49 lb.

The above were reaped on February 10.

The above returns cannot be regarded as good. These are due in some degree to the unfavourable season experienced, and to unsuitable soil conditions.

Broom Corn.

Repeated experimental trials for a number of years have been made with this crop, but except on a few occasions the returns obtained have not been large. Trials on a commercial scale have also been made and these also have not given satisfactory results. It would seem that only when high prices rule can this crop be grown at a profit in Antigua.

A $\frac{1}{10}$-acre plot of broom corn was planted on July 13 and reaping was finished on November 20; the return obtained was 175 lb. of dried, uncleaned heads. It must be remembered that, approximately only one-third of this would be marketable, the remaining two-thirds being seed (see Antigua Botanic Station Report, 1909-10, p. 10).

Castor Oil (*Ricinus communis*).

A $\frac{1}{10}$-acre plot of four varieties of castor oil was sown on September 17. Harvesting was completed on March 17.

The yields were as follows :—

Ricinus No. 3172, 15 lb. shelled seed or 450 lb. to the acre.
Ricinus No. 3173, 14 „ „ „ „ 420 „ „ „ „
Ricinus zanzibariensis 13 lb. shelled seed or 390 lb. to the acre.
Ricinus No. 3176, 11 „ „ „ „ 330 „ „ „ „

The returns from these varieties of Ricinus fluctuate considerably from year to year, but those obtained this season are decidedly poor.

English Potatoes (*Solanum tuberosum*).

A $\frac{1}{30}$-acre plot of the above crop was planted on January 9 and reaped on April 12.

The return from this area was 78 lb. or at the rate of 2,340 lb. to the acre. It appears that the growing of potatoes might prove a subsidiary industry of importance to such an island as Antigua. A large quantity of potatoes are imported annually and the price demanded by retailers is such as to indicate that even moderate returns would be profitable. (Notes on this crop are given under the head Possible New Minor Industries.)

Special Investigations by Agricultural Officers.

PLANT SELECTION.

Plant selection work now forms a somewhat important feature of the duties of the Officers of this Department of Agriculture.

Two factors which may be considered of primary importance when dealing with plant selection are acclimatization and fluctuations in food supply. The variations due to these may not be permanent, but it rests with the selection to take advantage of them in obtaining characters which are for the general improvement of the crop. Variation due to change of environment, necessitating as it does, an adjustment to a new set of conditions, has probably a greater effect on the subsequent crop than those due to normal fluctuations of food supply. Apart from this, however, it should be remembered that no two plants are exactly alike, and when this is considered in connexion with parental influence on progeny, it may be conceived that the possible ultimate influence of this work may be of importance. In point of fact the necessity for continuous work of this nature is indicated by the manner in which types or varieties of nearly all cultivated plants are liable to 'run out' if neglected.

Cotton Selection.

Most of the cotton selection work has been conducted during the last eight years at the Experiment Station at Skerretts. Seeds from plants finally retained have been distributed for the establishing of nursery plots on estates on which large areas were finally planted.

More recently however, this work has been transferred to Yeptons estate and the results obtained are such as to warrant an extension of the work on similar lines. Consequently it was decided that two estates situated in different parts of the island should be chosen on which selections should be made and trees obtained each year, from which a supply of seed could be raised for planting on types of land similar to that on which the mother plant grew.

Only a limited amount of land is available at the Experiment Stations, and apart from its unsuitability for raising fine types of Sea Island cotton, the work of raising hybrid cottons, which cannot for several reasons be performed on estates, will during the coming year require a large proportion of it.

The work started at Yeptons last year was continued during the year under report, and it is hoped next season to extend it to one more estate.

In the following tables the field and laboratory notes are given :—

COTTON SELECTIONS, FIELD NOTES.

No. of plant No. 368 Parent of plant $\frac{7}{1912}$.			No. of plant No. 374. Parent of plant, No. $\frac{7}{1912}$.		
Character.	Marks.	Remarks.	Character.	Marks.	Remarks.
Habit	10		Habit.	9	
Height		5 ft.	Height.		3 ft.
No. of bolls...	8	70		8	60
Max. no. of bolls per branch...	10	7		10	7
Shape of bolls	9	fairly good		9	
Size „ „	9	fair		9	
Distribution of bolls ...	10	good		10	good
Insects	9	some caterpillars		10	
Fungi	9	„ rust		9	
Resistance of disease ...					
Total marks	$\frac{74}{2}$			$\frac{74}{2}$	
Productivity					
factor i. e :—					
No. of bolls / Height	$\frac{14}{2}$			$\frac{20}{2}$	
Marks for field characters and productivity factor	44			47	

No. of plant 381. Parent of plant, $\frac{7}{1912}$.			No. of plant, 394. Parent of plant, $\frac{7}{1912}$.		
Character.	Marks.	Remarks.	Character.	Marks.	Remarks.
Habit	9		Habit	9	
Height		3 ft.			4 ft
No. of bolls...	8	71		9	84
Max no. of bolls per branch...	9	5		9	6
Shape of bolls	9			8	
Size „ „	8			8	
Distribution of bolls ...	9			10	
Insects	10			8	
Fungi	10			8	rust
Resistance to disease ...					
Total marks	$\frac{72}{2}$			$\frac{69}{2}$	
Productivity					
factor i. e. :—					
No. of bolls / Height	$\frac{24}{2}$			$\frac{21}{2}$	

Character.	Marks.	Remarks.	Marks.	Remarks.
Marks for field characters and productivity factor ...	48		45	

No. of plant 396
Parent of plant $\frac{2}{1912}$

Character.	Marks.	Remarks.
Habit	10	
Height		3 ft. 3 ins.
No. of bolls	8	64
Max. no. of bolls per branch	9	4 6
Shape of bolls	10	
Size of bolls	10	
Distribution of bolls ...	9	
Insects	9	
Fungi	10	
Total marks	$\frac{75}{2}$	
Productivity factor i. e. ... No. of bolls / Height	20 / 2	
Marks for field characters and productivity factor	48	

LABORATORY NOTES.

No. of plant.	Parent of plant.	Max. length of lint.	Min.	Average.	Marks.	Weak fibre per cent.	Marks.	Strength marks.	Evenness marks.
No. 368 ...	$\frac{7}{1912}$	47·3	38·5	44·1	4·1	14·5	15·5	8·2	7.0
No. 374 ...	$\frac{7}{1912}$	44·1	39·0	41·6	1·6	12·8	17·2	8·1	10 0
No. 381 ...	$\frac{7}{1912}$	44·3	37·5	41·7	1·7	14·6	15·4	8·5	7·0
No. 394 ...	$\frac{7}{1912}$	46·3	39·8	42·4	2·4	17·8	12·2	8·2	9·0
No. 396 ...	$\frac{7}{1912}$	48·2	42·5	45·9	5·9	5·9	16·2	13·8	8·8

No. of plant.	Fineness and lustre, marks.	Total marks.	Percentage of lint.	Marks.
No. 368	8·0 (Fair)	42·8	26·7	21
No. 374	10·0 (Good)	46·9	26·5	21
No. 381	10 0 (Good)	42·6	28·2	24
No. 394	9·0 (V. Fair)	40·8	28·4	24
No. 396	10·0 (Good)	48·5	23·5	12

SUMMARY OF MARKS.

Plants.	Total marks for examination of lint.	Marks for percentage of lint.	Total marks for field characters.	Total.
No. 368 ...	42·8	21	44	107·8
,, 374 ...	46·9	21	47	114·9
,, 381 ...	42·6	24	48	114·6
,, 394 ...	40·8	24	45	109·8
,, 396 ...	48·5	12	48	108·5

Three plants that were selected in the field were finally rejected on account of various undesirable traits.

Sweet Potatoes.

During the different reapings of this crop it has been noticed that the yield per hole, or in other words, the yield per plant varies in no small degree. For instance, if the average yield per hole in the plot containing the variety Hen and Chicks had been equal to that of the one giving the largest weight, the return from the plot would have been five times as great as it was. With the variety that has given indifferent returns for a number of years, i.e. Gent's Table, the difference is more pronounced, for had the plant giving the heaviest yield represented the average, the returns would have been twenty times as high as they were. In the case of the variety Bourbon, which is taken haphazard from the middle of the table on page 7 the difference would have been as great as that of Hen and Chicks.

The above appears to be of some significance, and plant selection on this crop was started this year and will be continued in the future. In the first instance it is intended that selection will, generally speaking, be based only on weights of roots of individual plants : possibly in the future other factors will be taken into account. A check on the value of this work will be kept by planting duplicate plots from unselected plants.

This crop is of the greatest importance to the island, and the work done at the Experiment Stations in connexion with it, judging by the amount of planting material distributed, is being appreciated ; and it is hoped that experiments undertaken to increase the yields of the various standard varieties will add to this.

Eddoes.

Selection experiments with the view of improving the yield of this crop were commenced during the year. The weight from each individual hole was taken and the subsequent crops will be planted from the harvest of these.

In order to test how the reverse of this operation would effect the yield, eddoes of each variety, from the hole weighing the lightest, will be planted by the side of the others.

Yams.

Plant selection work was started on the yam varieties, but unfortunately those selected for future planting were mixed with others.

HYBRIDIZATION OF COTTON.

The work of hybridizing cotton has now been conducted for three years. It will probably be remembered that these experiments were originated with the object of raising and fixing a type of cotton possessing the lint qualities of the Sea Island cotton, combined with the hardiness of plants producing short-stapled cotton.

In the first instance four crosses were attempted in Antigua ; in one case a failure to cross was recorded, and in the second, although the seeds germinated no plants were raised. Seeds from another hybrid were received from the Imperial Commissioner of Agriculture.

During the year considerable difficulty was experienced in obtaining plants from the (F_2) generation of these hybrids. This was due possibly to some extent to drought, but as artificial watering was resorted to, it seems possible that at least a part can be placed to the credit of indifferent powers of germination. The cross Sea Island × Antigua Native was lost during the year.

It will possibly be remembered that the characters used as a basis for Mendelian classification were, length of lint and resistance to disease ; lint over 38 mm. being termed long, and resistance to disease meaning resistance to leaf-blister mite (*Eriophyes gossypii*).

The results from the examination of these hybrids are given in the following table :—

Parentage and distinguishing number of original hybrid.	Dis. No. in F_3 gen.	Length of lint. Results from examination of five seeds.			Resistance to Eriophyes.	Total long lint.	Total short lint.	Total resistance to Eriophyes.	Total non-resistance to Eriophyes.	Total resistance to Eriophyes possessing long lint.
		Max.	Min.	Aver.						
Sea Island × Saint Eustatius ...	1	43·5	38·0	42·2	Non-resist :					
Southern Cross ...	2	48·0	42·0	44·7	Resistant					
Hybrid No. 1 ...	3	39·3	34·8	37·7	Non-resist :					
	4	38·0	33·5	35·5	„ „					
	5	44·8	37·5	41 7	„ „					
	6	38·0	34·3	35·9	„ „					
	7	41·3	37·8	38·7	„ „	4	3	1	6	
Sea Island × ...										
Southern Cross ...	8	41·6	39·5	40·3	Non-resist :					
Hybrid No. 2 ...	9	40·5	33·0	38·3	Resistant	2	0	1	1	1
Sea Island × ...	10	43·5	37·5	41·8	Non-resist :					
Southern Cross ...	11	41·5	40·3	40·7	„ „					
Hybrid No. 3. ...	12	41·0	36·0	38·0	„ „					
	13	43·3	38·8	40·2	„ „					
	14	42·5	35·8	38·5	Resistant					
	15	38·5	37·0	37·7	Non-resist :					
	16	41·3	37·5	39·8	Resistant :					
	17	42·8	38·5	39·0	„ „					
	18	44·5	42·3	43·5	Non-resist :					
	19	43·3	41·5	42·2	„ „					
	20	42·0	39·0	40·6	„ „					
	21	40·8	36·5	38·9	„ „					
	22	43·8	37·5	40·9	Resistant.					
	23	44·8	38·8	42·5	Non-resist :					

Parentage and distinguishing number of original hybrid.	Dis. No. in (F_3) gen.	Length of lint. Results from examination of five seeds.			Resistance to Eriophyes.	Total long lint.	Total short lint.	Total resistance to Eriophyes.	Total non-resistance to Eriophyes.	Total resistance to Eriophyes possessing long lint.
		Max.	Min.	Aver.						
Sea Island × ...	24	44·3	39·3	40·8	Non resist :					
Southern Cross ...	25	39·5	35·5	38·6	„ „					
Hybrid No. 3. ..	26	40·3	37·8	39·3	„ „					
	27	41·8	37·5	40·0	„ „	16	2	4	14	4
Sea Island × ...	28	39·5	35·0	37·7	Non resist :					
St. Eustatius ...	29	42·8	39·3	41·5	„ „					
Hybrid No. 4. ...	30	43·5	39·0	41·1	„ „					
	31	43·8	41·0	42·1	„ „					
	32	42·3	37·5	40·1	„ „					
	33	40·3	35·8	38·2	„ „					
	34	43·3	41·5	42·1	„ „					
	35	41·8	40·8	41·1	„ „					
	36	46·3	40·0	43·2	„ „	8	1	0	9	0

The lint from these crosses was examined at the Botanic Station ; the total number of lengths taken was 180.

During the coming season it is hoped that at least a $\frac{1}{40}$-acre plot of each of the most promising of the above will be planted. From these further selections will be made in this manner it is hoped, a fixed type may be produced.

Work Connected with Insect and Fungus Pests and their Control.

SUGAR-CANE.

The pest which causes the greatest amount of monetary loss to the Antiguan planter is root disease of the sugar-cane (*Marasmius sacchari*). During the year the ill-effects of this disease were noticeable, especially on ratoon canes. The work of this fungus is much more in evidence during unpropitious seasons than when conditions are favourable. It is specially noticeable on impoverished soils of a heavy nature, and more virulent on some varieties of canes than others. Good cultural operations and careful selections of varieties are probably the two most efficient weapons with which to combat this disease.

The grubs of the hard back beetle, mentioned in last year's report, were fairly abundant in cane soils during the earlier part of the year. During the planting season, in most fields a good stand was obtained. Probably the depth at which these pests are found depends on the amount of water contained in the soil and as fairly good weather was then experienced, the grubs were possibly at a higher level than the ends of the cane cuttings, which thus escaped attack.

It will be remembered that these grubs attack the cane directly, and the cut end of the plant is possibly the most vulnerable point of attack.

There are various other diseases common to the cane of Antigua but the above are of primary importance.

COTTON.

The most serious pest which attacks this crop in Antigua is the flower-bud maggot (*Contarinia gossypii*). Its early appearance in the growing season results in greatly reduced yields, as the nature of its attack prevents the successful use of insecticides as a means of control.

Its presence in the windward district of the island was reported to Officers of the Department of Agriculture late in the month of December. When compared with previous years, its appearance was somewhat late ; this may be accounted for by the weather conditions existing just previous to this date. It is satisfactory to report that during the season under review little damage was done by this pest. Flower-bud maggot of cotton was first noticed in Antigua in the year 1907-8 when its attacks in some places were so severe as to threaten the extinction of the industry. Since then the attacks, on the whole, have decreased in severity ; and taking into consideration that no deterrent in the shape of insecticides has been applied, it would seem as though nature has adjusted conditions to some degree

Decreased areas with the corresponding decrease of host plants possibly brought the work of insects parasitic on the pest more into evidence.

Efforts are annually made to plant early in the season, but this is a matter of impossibility in some cases, owing to drought. This latter factor, drought, has also possibly had some considerable effect in keeping this pest in check, for wet weather favours its increase.

Several severe attacks of caterpillars (*Alabama argillacea*) were experienced during the year. With this the cotton planter has little to fear if he possesses a good stock of Paris green. Showery weather often causes considerable inconvenience, but it is seldom that repeated dustings are washed off sufficiently quickly to prevent the majority of the insects being poisoned. The reserve stock of this insecticide held by the Department was again requisitioned during the year, and although this is small, it has on sveral occasions been the means of saving a large proportion of the crop from being eaten down.

Leaf-blister mite (*Eriophyes gossypii*) was fairly common on some fields of young cotton and commonly found on old cotton during the latter end of the season. In the former case it attacked young plants whose growth had been

stunted by dry weather. When infestation of a crop takes place early in the season, this pest limits the return considerably. Little cognisance is taken of it, however, when on old cotton, for ratooning is never performed and a second crop seldom looked for.

There is however the probability of the possible ravages of this pest being under-estimated. In some few cases old cotton was left growing in the vicinity of the young crop. Such a practice cannot be too strongly condemned ; unfortunately it is not only the owner of such infested cotton that stands to lose by this practice, for there is the possibility of his neighbour's cotton being infested from the same source.

The boll worm was responsible for a certain amount of damage in some few instances, but, on the whole, the crop was fairly free from this. It has never assumed serious proportions in Antigua.

Various other pests are common to this crop, but those mentioned above are the most important.

LIMES.

During the latter end of September, a new pest was found attacking this crop. This was subsequently identified by the Imperial Bureau of Entomology as *Elaphidion mite.*

In December, Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, visited Antigua. and the following is an extract of his report on this visit which appeared in the *Agricultural News* of March 15, 1913 :—

' The attack on a lime branch apparently always begins in a small twig. It is not possible to say whether the twig on or in which the egg is laid is dead or dying at the time of egg-laying. The branch is always more or less girdled by the tunnel of the grub. This girdling seems to be the first thing done by the grub on reaching the branch, and it results in the death of the branch beyond the point of the girdle. The entire grub and pupa stages of development are passed within this, the adult beetle only issuing from the dead branch some time after emerging from its pupal condition

' It is likely that the beetle has occurred as a pest of limes in Antigua for some time but has been overlooked. It is very probable that it has a considerable range of food plants from which renewed attacks on limes may be experienced from time to time. The presence of this insect, however, should not prevent the development of the lime industry in Antigua, as it ought to be a fairly easy pest to control.

' The remedy to be employed is obvious. Any dying branch on which leaves are curling up or turning yellow, should be carefully examined for the presence of the borer, and if the grub can be found it may easily be dug out, or the branch may be removed sufficiently far back towards the tree to ensure the removal of the grub.'

In connexion with this it may be stated that, at Mr. Ballou's suggestion, a small trial importation of tree loppers was made by the Department for use in controlling this pest. These proved extremely useful tools and further importations have been since made by planters.

Scale insects are generally speaking everywhere abundant on this form of cultivation, and with the possible exception of the red scale (*Aspidiotus aurantii*) do not appear to be increasing. The green scale (*Lecanium viride*) appears to increase at times to a somewhat alarming extent, and it then almost entirely disappears. A large proportion of these scales are parasitized by an entomogenous fungus, *Cephalosporium lecanii.*

The results of spraying experiments for the control of scale insects are given under the heading The Lime Industry.

COCO-NUTS.

Apart from attacks of scale insects which have done little or no damage, this crop has been free from pests.

MISCELLANEOUS.

During the year some instances were noted of the attack of hard back grubs on the roots of maize. The pest is probably similar to that described under the heading of Sugar-cane. The onion crop suffered slightly from caterpillar attacks and cassava from the same pest. The cowpeas in several places were attacked by a boring larva. It is possible that the failure in the past in some instances of this crop to make normal growth was due to the work of this insect. It must not however be confounded with the leaf-eating caterpillar* which often makes the growing of cowpeas a hazardous undertaking in this island.

FUMIGATION.

All plants imported into the Presidency during the year received attention as regards fumigating.

Progress in the Chief Industries.

THE COTTON INDUSTRY.

The area planted under this crop for the year under review was approximately 800 acres, showing an increase over that of the previous season of 367 acres. In addition there was 130 acres planted in Barbuda, the total area for the whole Presidency being 930 acres.

The planting season extended from the month of June to October. About 60 acres were planted with cane, as an intermediate crop but this practice is not as a rule so successful in Antigua as it is in the neighbouring island of St. Kitts. Dry weather often prevents early planting, in consequence of which poor stands are obtained, and on the whole, it can hardly be said that it is a satisfactory one.

During the past season difficulty was experienced in many cases in establishing the young cotton, and in some instances leaf-blister mite attacked the plants when in a young stage, while in a few isolated instances the attacks of caterpillars were neglected, and some damage was caused in this way.

Six hundred and forty-one bales were shipped, making a total of 154,430 lb. of lint reaped for the season just ended. This gives an average return of 197 lb. of lint per acre, the value of which would be between £10,000 and £11,000. The return per acre is the largest since the inception of the industry. The industry has experienced three good years and there is every indication that a generally increased area will be planted next year. It might again be mentioned that normal increases are hoped for, and that reckless planting should be carefully guarded against.

A return of 197 lb. of lint to the acre indicates in an unmistakable manner that the growing of cotton was profitable during the season under review. The last few seasons have witnessed a gradual diminution of the worst pest that the local grower has to contend with, i.e. the flower-bud maggot. It is possible that weather conditions experienced have been the controlling factor. This would account for increased yields, but it is also possible that acclimitization of plants and seeds may be partly responsible for the result.

The difficulty experienced in disposing of the crop during the past few years has proved something of an obstacle to the further development of the industry.

The returns obtained from Sakellarides, Southern Cross, and cottons other than Sea Island, have been found not to be remunerative in the past, when

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*Identified as *Thermesia gemmatalis*.
The cassava caterpillar is the larva of the moth *Dilophonota Ello* L. This is not the same as that which attacks the onion.

planted on a commercial scale. Consequently during the past season only Sea Island was planted.

Notes on insect pests attacking this crop in Antigua will be found under the heading Work in Connexion with Insect and Fungus Pests.

As mentioned above, the acreage under cotton in Barbuda was 130 acres. From this area 29,955 lb. of cotton was reaped; the return per acre was good, being 230 lb. of lint. There were no severe attacks of insect pests; instances of the boll worm were found early in the season, and attacks of caterpillars were experienced, but neither did any particular damage to the crop. Late in the season, when the plants were being destroyed, a few specimens of flower-bud maggot were found.

In conclusion it may be said that, on the whole, the cotton season under review has been the best since the re-introduction of the industry into these two islands.

THE SUGAR INDUSTRY.

Another season of drought has again to be recorded.

As stated, root disease (*Marasmius sacchari*) is an important factor controlling the output of sugar from Antigua.

The total quantity of sugar exported from the island for the year was 11,690 tons, made up of 7,503 tons of 96° crystal and 4,187 tons of muscovado.

A large number of experiments are conducted by the Agricultural Department in connexion with this industry. Approximately 1,000 plots situated in various parts of the island are laid out, mainly with the view of testing the adaptability of different varieties to various types of soils, and the effects of different manures on the growth of standard varieties.

The work on sugar-cane varieties in Antigua is extremely interesting, and is followed up keenly by all members of the planting community. A perusal of the reports on sugar-cane experiments in the Leeward Islands, which are annually written by the Superintendent of Agriculture for this Colony, indicates that acclimatization to local conditions is a factor of considerable importance in connexion with these.

Roughly speaking, about half the acreage under sugar-cane cultivation in Antigua is planted with the variety White Transparent. Then as regards popularity come Sealy Seedling and B. 147. Other varieties have attracted a considerable amount of attention locally: among these may be numbered B. 4596, and more recently, B. 3922.

It is interesting to report that even peasant growers now make enquiries at the Experiment Station as to the merits of the various varieties.

In connexion with the industry, a nursery plot is maintained at Skerretts for the propagation of seedling canes. After the Experimental Stations are supplied, the surplus plants are put up for auction; in this way in the space of five years half a million cane plants have been distributed. It is the practice only to sell varieties that have been under trial in various parts of the island, for at Skerretts there are numerous canes which have not been in cultivation, as well as some that have from time to time been discarded as unworthy of further trials on estates.

The important problem of transporting cane cuttings long distances was solved some years ago by Mr. J. R. Bovell in Barbados. The method adopted by him was the well-known one of packing in damp charcoal. This was efficacious, its only drawback being the bulk of the package used and the resulting high freight on such.

Some short time ago the Department received from Hawaii a small package of cane cuttings through the Post Office. The canes were about 9 inches long, the ends of each were waxed, paraffin wax being possibly what was used for this purpose, and the whole was then packed in damp Sphagnum moss and wrapped

in one covering of oil paper, after which there were several coverings of ordinary newspapers and one of brown paper. This method of packing canes is a simple one and appears to be worthy of trial on a small scale, for when the cuttings from Hawaii arrived in Antigua, two months after being posted, they were quite fresh.

The canes under discussion were received from Mr. G. P. Wilder of Honolulu.

Progress in Minor Industries.

THE LIME INDUSTRY.

Local interest in the growing of this crop has been maintained during the year under review. During this period nearly 44,000 plants were distributed in the island, this being sufficient material to plant approximately 220 acres. Many of these were used for supplying vacant spaces in plantations recently established.

If this industry is to be a success in Antigua, the greatest care will have to be exercised in choosing sites for new plantings. Speaking generally, the rainfall in this island is too low for lime growing, and when this factor is combined with indifferent soil and a wind-swept situation, very little hope can be entertained of ultimate success. The influence of wind on this crop cannot be over-estimated, and it would be well for the local lime growers to give the question of wind-breaks serious consideration.

The question of scale insect control is a serious one; but in this connexion it appears probable that the influence of unsuitable soil and other conditions on the trees is at times put down to the effects of these pests. In some places parasitic fungi and insects are probably responsible for their control. On a few plantations, lady-bird beetles are abundant—two are particularly common, the well-known red insect (*Cyclonida sanguinea*), and a small bluish-brown or black variety.

Some experiments for the control of scale insects, especially the West Indian red scale, on lime trees, were laid out during the year. Three plots, each consisting of fifteen trees, were laid out. Plot No. 1 was sprayed with the standard insecticide, rosin wash, Plot No. 2 with the insecticide invented by Mr. J. C. Moore of St. Lucia known as 'scalo', in the proportion of 1 gallon of water to 1 lb. of scalo. Plot No. 3 was sprayed with scalo in the proportion of 1 gallon of water to 2 lb. of the insecticide. These trees were sprayed on February 11, and examined on September 9—seven months afterwards.

The following abbreviations are used in the annexed table :—

W.S. = White scale (*Chionaspis citri*)
G.S. = Green scale (*Lecanium viride*)
R.S. = Red scale (*Aspidiotus aurantii*)
P.S. = Purple scale (*Lepidosaphes beckii*)
B.B. = Black blight (*Capnodium* sp.)

Plot No. 1
Notes taken.

The formula for scalo is as follows :—

Whale oil soap	—	— 56 lb.
Water (2 gallons)	—	— 20 „
Crude naphthalene	—	— 6 „
Kerosene (one case)	—	— 65 „

No of tree.	Pot. 1. Notes taken at time of spraying.	Plot. 1. Notes tak (seven months after spray-ing.	Plot. 2. Notes taken at time of spraying.	Plot 2. Notes taken seven months after spray-ing.	Plot. 3. Notes taken at time of spraying.	Plot. 3. Notes taken seven months after spray-	Control Plot. Notes com-piled on Sept. 9.
(1)	Fairly clean Little W. S. on bark.	Clean	Much R. S. P. S. and W. S. Little B. B.	Little G. S. W. S. and B. B.	Little W. S.	Dead. Destroyed by cattle.	Clean.
(2)	Much R. S. Little W. S. and B. B.	Little W. S.	Much G. S. Little R. S. and W. S.	Little W. S. and R. S.	Little W. S.	Little W. S.	Little W. S.
(3)	Little W. S.	Clean.	Little R. S.	Clean	Clean	Little W. S.	Clean.
(4)	Much R. S. and W. S. Little B. B.	Little W. S. and G. S.	Little R. S.	Little R. S. and G. S.	Much R. S. G. S. and B. B	Much R. S. and G. S.	Much R. S. and W. S.
(5)	Much R. S. and W. S. Little B. B.	Little G. S. and R. S.	Much R. S. and B. B.	Little R. S. and G. S.	Much R. S. and B. B.	Little R. S.	Much R. S. G. S. and B. B.
(6)	Little R. S. and B. B.	Little R. S.	Much R. S.	Little R. S. and G. S.	Much R. S. G. S. and B. B.	Little R. S. and G. S.	
(7)	Much R. S.	Died back. New growth made. Little R. S.	Much R. S.	Little R. S.	Little R. S. G. S. and W. S.	Much R. S. G. S. and W. S.	Clean.
(8)	Little R. S. and B. B.	Much R. S. and B. B.	Much P. S. Little B. B.	Much G. S. Little B. B.	Much R. S. G. S. and B. B.	Dead	Much G. S. R. S. and W. S.
(9)	Little R. S. and B. B.	Little G. S.	Little P. S.	Clean	Much R. S. and G. S.	Clean	Little R. S. and G. S.
(10)	Littlt R. S. and B. B.	Little B. B.	Much R. S. and G. S. Little W. S.	Little W. S.	Much R. S.	Clean	Clean.
(11)	Tree died down (unsprayed)	Long gro wths. Clean.	Much R. S.	Much R. S. and G. S.	Much R. S. and G. S.	Much R. S. and B. B.	Much W. S. and G. S.
(12)	Tree died down (unsprayed)	Long growths. Clean.	Much R. S.	Clean	Much R. S. and G. S.	Clean	Little W. S.
(13)	Tree died down. Young shoot sprayed.	Long growth Clean.	Much R. S.	Clean.	Much R. S. Little G. S.	Clean	Clean.
(14)	Much R. S. G. S. and B. B.	Clean	Much R. S. some G. S. and W. S.	Little G. S.	Much R. S. and G. S.	Clean	Much G. S.
(15)	Much R. S. and W. S.	Little G. S.	Much R. S.	Clean	Much R. S. W. S. and G. S. Little B. B.	Little G. S. and B. B.	Clean.

Unfortunately notes were not taken of the amount of scale insect inspection of the control plot when the experiments were laid out.

The above table is interesting, but the results obtained are somewhat contradictory in character.

Notes compiled each month on a limited number of trees for a year as to the increase or decrease of scale insect attacks would probably bring to light a number of interesting and important facts in connexion with these pests.

It might be said, however, that the general health and freedom from scale insect attack of the control plot in September was equal if not superior to that of the sprayed plots. This experiment will be again undertaken in the future.

COCO-NUT INDUSTRY.

The interest in this crop has been maintained during the period under review, when, as will be noted in another part of this report, 3,739 plants were distributed. This material is sufficient to plant 78 acres, for in practically every case coco-nuts are planted 30 feet by 30 feet, which means that forty-eight trees occupy 1 acre of land. The existing plantations in Antigua are, on the whole, in a promising condition; but it seems more than likely that the question of drainage on some of the lands will have to receive attention in the near future.

It is a recognized fact that the palm will grow in wet lands provided that the water is in no way stagnant; but it is absolutely necessary that the subsoil water should be constantly moving. There are fairly large areas of lands in this island on which paying crops of coco-nuts would possibly be grown if a satisfactory solution of the drainage problem could be found. Some of these are at just above sea-level, and natural lines of demarcation from the sea have been formed by banks of sand. In such cases as these, where no natural outlet for the water can be obtained, it seems possible that a movement of water underground could, without very great expense, be created by pumps, using the wind as motive power.

The question as to whether coco-nuts can be grown successfully on heavy lands such as exist in large quantities in Antigua will probably be answered in the future, for four experimental plots have been laid out recently on this type of soil. Holes 4 feet cube were taken out and these were filled in with manure mixed with surface soil in which the growing nuts were planted. The cost of such method of planting would be, apart from clearing bush and lining, about 2s. per hole, or roughly at the rate of £4 per acre, which as an initial outlay for a permanent crop cannot be regarded as high.

The question as to the advisability of planting this crop from nuts obtained from young trees has often been raised. Most growers are in favour of retaining seeds only from fully matured trees with which to establish plantations, although often good reasons for this cannot be given. The influence of the age of the parent tree on the character of its offspring is of interest, although it is probably an unanswerable question at the present moment. Nuts obtained from coco-nuts five to seven years old, however, do not appear to possess the same vitality as those obtained from mature trees. In Antigua, during the period under review, 250 nuts were obtained from young trees, and six months after planting only 100 had germinated. This cannot be put down to drought, for good rains were experienced soon after they were put in the nursery beds. The apparent lack of vitality shown by nuts taken from young trees seems to be of almost sufficient importance, apart from any other consideration, to warrant advising growers to establish plantations from seeds obtained from mature trees. The germination of nuts from older trees was quicker and better than this. No germination of less than 50 per cent. has been obtained from the latter in Antigua during the last three to four years, the average being about 65 per cent.

Another point in connexion with the material used for the establishing of coco-nut plantations of some importance, is the comparative size of the husked nut with that of the unhusked one. At the present time coco-nuts are not grown for coir, and apart from the probability of variations in the thickness of the husk in different varieties, it would seem that climatic or soil conditions largely account for these differences.

In the case of coco-nuts grown in Antigua, the green pericarp is usually small though the nut contained therein may be of a satisfactory size. To the casual observer the apparent small size of the Antigua nut when compared with those grown in other localities may cause unfavourable opinions to be formed regarding them, which the true state of affairs does not warrant. In this connexion the following measurements were carried out.

Lots of six nuts each from Antigua, Dominica, and Nevis, respectively, were taken, the external diameter of the unhusked nuts was determined in each case, the husk was removed and the diameter of the husked nut determined.

The results obtained were as follows :—

ANTIGUA NUTS.

Diameter of unhusked nuts in inches.	Diameter of husked nuts in inches.	Difference between husked and unhusked nuts in inches.
5·56	4·45	1·11
6·36	4·60	1·76
6·00	4·60	1·40
5·56	4·45	1·11
6·00	4·77	1·23
5·82	4·14	1·68
Total for six nuts 35·30	27·01	8·29
Aver. diameter per nut 5·88	4·50	Average difference in diameter per nut 1·38

DOMINICA NUTS.

Diameter, etc.	Diameter, etc.	Difference, etc.
8·27	4·45	4·04
9·10	4·60	4·50
8·00	4·60	3·40
7·50	4·20	3·30
8·27	4·77	3·50
8·43	4·14	4·29
Total for six nuts 49·57	26·76	23·03
Aver. diameter per nut 8·26	4·46	Average difference, etc. 3·84

NEVIS NUTS.

Diameter of unhusked nuts in inches.	Diameter of husked nuts in inches.	Difference between husked and unhusked nuts in inches.
7·99	4·45	3·34
7·31	4·46	2·75
8·27	4·56	3·71
7·95	4·37	3·58
6·68	4·69	1·99
7·95	3·34	4·61
Total for six nuts 46·15	25·97	19·98
Aver. diameter per nut. 7·69	4·33	3·33

The above figures are extremely interesting and illustrate in a striking manner the great differences in size which exist between the unhusked Antigua coco-nuts and those grown in other places ; they also indicate how deceptive these appearances may be, since on comparison it will be seen that although the average difference between six unhusked Antigua and Dominica nuts was as much as 2·38 inches in favour of the latter, the husked Antigua nuts were 0·40 inch larger than the others. Much the same thing is seen when a comparison is made between the Antigua and Nevis nuts.

In the above tables only the results from the examination of six nuts from each place are given ; this was on account of the fact that only a limited number from Nevis was available.

In subsequent trials twenty nuts from Dominica were measured and twenty-seven from Antigua. The average diameter of the unhusked nuts from the former was 8·27 inches, that of the husked nuts 4·57 inches. From the local nuts the figures obtained were 5·81 and 4·42 inches, respectively. It will be seen that there is but little variation in the figures when larger numbers are taken, the average differences in the diameters of the actual nuts being but 0·15 inch in favour of those from Dominica, while the average differences in the thickness of the husk was as much as 2·46 inches.

It would be extremely interesting to know if these differences extend to the kernel and shell. It is hoped in the near future to clear up this point.

THE ONION INDUSTRY.

For the last three or four years the area planted under onions has varied but slightly, the amount planted each season being about 60 acres. During the period reviewed the only pests attacking the crop were caterpillars. Large returns were reaped, in some cases as much as 8,000 lb. to the acre being harvested. A crop such as this deserves a considerable amount of attention, and if the details of harvesting and curing were carefully carried out and combined efforts made to secure markets, the area in this Presidency could with ease be greatly increased.

This year the number of growers was probably larger than on any previous occasion ; many of these were however of the peasant class who grow only for the local market ; this demand is naturally small and easily satisfied. In some cases where onions were exported during the past season they were delivered in fairly large quantities, on a full market. Again they at times arrived in indifferent condition owing to bad packing. The crop was also late owing to drought, and when shipped had to compete with produce from other centres. With this industry every effort should be made to reap early in the year. As a general rule onions shipped later than February or March bring indifferent prices.

Another point against the Antigua onion when placed on foreign markets was its size.

Co-operation among the growers would do much towards solving the problem of local supply, as well as preventing the repetition of shipping to an indifferent market ; the condition could be ascertained by cable before shipments were made.

Previous to shipping, the handling of the produce is often extremely unsatisfactory. At times it is heaped up in the field and crated, whereas the bulbs should be left in the sun for a few hours only and then taken to dry for about a week in a cool airy room. The question of erecting drying houses for this purpose might be considered ; where this is impossible old boiling houses might answer.

Another important point overlooked by the Antiguan onion growers is grading. The standard sizes could not well be adopted by the local shipper : they are known as primus, seconds and picklers. The first includes all those $1\frac{1}{4}$ inches in diameter and over, the seconds, $\frac{3}{4}$ to $1\frac{1}{4}$ inches in diameter, while the picklers are those less than $\frac{3}{4}$-inch in diameter. The writer would suggest that the sizes should be 4 inches and over, 4 inches to 3 inches, and those less than 3 inches in diameter. The term 'picklers' could not be adopted for the local small onion, but 'thirds' would take its place.

As to the size of the Antigua onion, closer planting in the field might be practised, and a trial might be made of planting the seed *in situ*. If the latter suggestion is tried, two to four seeds should be planted 6 inches apart, or the seeds very thinly planted in drills. Careful thinning out would have to be done if either of these two methods be tried.

Finally it might be stated that the Antigua onion is by no means one of high grade, but careful attention to details would build up a good reputation and create a demand in early markets for it. Without this attention the local

produce will retain its present status and it will be passed over in markets when competing with produce from other centres where as a rule the crop receives the best of skilled attention. The crop is easily and cheaply grown ; it is as a rule lucrative ; it is capable of considerable expansion and therefore worthy of careful fostering.

PINE-APPLE INDUSTRY.

Decreasing areas have been planted in this crop in Antigua for some considerable time. The reasons for this are primarily the unsuitable shipping facilities, and secondly the indifferent keeping qualities of the fruit. The cultivation of pine-apples is mainly in the hands of peasants who, on the whole, grow to sell to shippers or for the local market.

As regards size and general appearance the local fruits are decidedly indifferent, but their flavour is excellent. Their poor keeping qualities, which are a great handicap to extensive cultivation, are probably due at times to black heart disease; but it must be acknowledged that they are handled in a very rough manner, this alone being often sufficient to ensure delivery of the fruit in an unsound condition at the end of the voyage.

It has been stated that the manurial constituents of the soil in which these plants grow have a considerable effect on the keeping qualities of the fruit and that a soil rich in nitrogen and deficient in potash causes the formation of soft fruits. This point would easily be elucidated by local pine growers themselves, for it seems one of importance.

It would appear that if this industry is to increase, careful selections on the local pines should be made ; but it must be stated, however, that this would be extremely difficult as the greater part of this type of cultivation is in the hands of peasants.

Much also could be done by combination as regards the compiling of rules for shippers as to the size, handling, packing, etc., of the produce. A rigid adherence to these if carefully drawn up would probably lead to a much better class of pine-apple being exported, which would almost automatically create a demand and do much towards rehabilitating the reputation of the Antigua pine.

During the latter part of the year under review a number of varieties were imported by His Excellency Sir Hesketh Bell, K.C.M.G., for experimental purposes. These consisted of Red Ripley, Green Ripley, Queen, Red Spanish, China, and others. The result of these trials will be of interest, for if it can be demonstrated that by proper tillage operations, careful handling and attention to details, this form of cultivation can be made profitable, the trials under discussion will certainly lead to others which may have a far-reaching effect on pine-apple growing in this island.

NOTES ON POSSIBLE NEW MINOR INDUSTRIES.

Rubber.

A few trees of the Jequié Maniçoba rubber (*Manihot dichotoma*) are, at the time of writing, fruiting. This fact may be one of importance if this form of cultivation is to be extended in Antigua.

The flowers and leaves of these trees vary to some considerable extent and it may be possible that more than one variety of this Manihot was imported, and it seems advisable that tapping experiments should be carried out on each individual tree before seeds for planting purposes are finally selected. A few small trial plantations have been established in which the trees continue to be healthy and, on the whole, look promising, and it is hoped that information as to yields, etc. will soon be obtainable.

Oils.

Orders have been received at the Botanic Station for several thousand plants of the Bay (*Pimento acris*), and if seeds of this tree can be obtained several experimental areas will in the near future be planted in Antigua. The young trees planted some four years ago at Scotts Hill are now bearing a few seeds, but these will in no way be sufficient to meet the demand. It might be stated that the factor limiting the planting of these at the present moment is the scarcity of seed.

Papaw.

Enquiries have been made at the office in connexion with the possibilities of growing papaw (*Carica papaya*) on a commercial scale for the preparation of papain. Orders have been received for a fair number of plants, and during the next few months several experimental areas of this crop will be planted.

Little information exists as to the amount of papain yielded per tree, or the best methods for preparing this. Experiments are being conducted to answer some of these questions.

Vanilla.

An interesting experiment is being conducted by His Excellency Sir H. Hesketh Bell, K.C.M.G., in connexion with the growing of this crop. The land on which this is being conducted is situated in a rich sheltered valley; the results of this trial will be awaited with interest; so far the plants are healthy and are in a promising condition.

Broom Corn.

No attempt was made this year by any planters to grow this crop on a commercial scale, and the experience obtained in the past gives but little hope of this industry ever assuming large dimensions in Antigua.

Cacao.

The dryness of the weather experienced during the year under report prevented any attempt being made to increase the acreage under this crop.

English Potatoes.

Of late years the growing of the above crop in this island has received but little attention in spite of the fact that large importations of potatoes are made annually. During the season under review, however, about 8 acres have been tried by different individuals with success.

Owing to the possible importance of this crop it will not be out of place to put on record a few comments in conneixon with it. A cheap way for the planters of Antigua to grow this vegetable would be on the banks of cane fields. The two crops would not interfere with one another and there would be but little difficulty in disposing of the produce either locally or intercolonially.

It would seem that the best time to plant potatoes is between the months of October and March. The size of the setts vary, but it is a good rule never to make a sett less than 1½ oz. in weight. If the weather is dry probably better results will be obtained with larger setts.

The pieces should be planted in rows in fairly rich soil 2 feet to 2 feet 6 inches apart and 9 to 12 inches apart in the rows; the depth varies with the soil and weather conditions, but the minimum should be 4 inches and the maximum 8 inches.

Little is known locally about the cropping capabilities of different varieties: this is an important point as probably some will yield little or nothing in the tropics. Varieties which have the reputation of giving good results in West Indian islands other than Antigua are Beauty of Hebron and Burbanks.

Efforts in Connexion with General Agricultural Progress.

NEW MEANS OF MANURING.

As mentioned in other reports of this Department, until recently a large proportion of the ratoon canes in Antigua received dressings of artificial manures consisting almost entirely of nitrate of soda or sulphate of ammonia. More recently however, these have been replaced by nitrate of lime, the effect of which, on ratoon canes in Antigua, is about equal to that of nitrate of soda. This manure contains between 12 and 13 per cent. of nitrogen and about 25 to 30 per cent. of soluble lime. Its hygroscopicity has been stated to interfere somewhat when being applied to lands, but this is probably not a very serious fault.

It does not appear that nitrolim or calcium cyanamide is adapted to the requirements of ratoon canes in Antigua.

The results of experiments with molasses as a fertilizer for ratoon canes show that, on the whole, the addition of this fertilizer is not remunerative. Trials with this as a manure for plant canes which have not received pen manure are to be made in the future. It will be remembered in connexion with this that the theory was put forward from Mauritius where these experiments were first conducted that the sugar contained in molasses stimulated the micro-organisms which are capable of fixing the free nitrogen of the air.

Experiments with the new manure, nitrate of ammonia, are to be conducted during the coming year. This fertilizer contains about 17½ per cent. of nitrogen as ammonia and approximately the same quantity as nitrate.

As foreshadowed in last year's report, the line of investigation to be followed in the future will be one connected with the problem of finding the best substitute for pen manure for plant canes when this cannot be obtained, and experiments with the object of solving the question will be laid out during the coming season.

It might be mentioned that about 300 experimental plots situated on four stations are used in Antigua for experimental work in connexion with the manurial requirements of sugar-cane.

MODERN SUGAR-MAKING.

During the year 1912 Gunthorpes Central Factory manufactured 6,239 tons of sugar, the total quantity of canes crushed being 59,370 tons, the canes yielding 10·51 per cent. of sugar or 9·51 tons of cane to 1 of sugar. The price paid for 1 ton of cane varied from 10*s.* 0*d.* to 16*s.* 11*d.*, the price of sugar being high throughout the season.

Additions were made during the year to the building, plant, and dam, a new locomotive and new trucks were added to the stock, and repairs were carried out on the railway line.

The average annual amount of canes crushed from 1905-11 was 37,856 tons, thus the quantity handled this year was 11,514 more than the average for the previous seven years. For the same period the average output of sugar was 3,966 : thus 2,273 tons more than the average was manufactured during the period under report.

The following table shows the quantities of cane ground since the year 1907, with the quantities supplied by peasants and estates :—

	1907.	1908.	1909.	1910.	1911.	1912.
Estates	36,735	39,817	35,222	44,777	52,904	56,706
Peasants	4,047	3,243	2,062	3,542	3,212	2,664
Total	40,782	43,060	37,284	48,319	55,116	59,370

The above shows a large decrease in the quantities of cane grown by peasants with a corresponding increase of those grown by estates.

During the year under report Bendals Factory manufactured 1,430 tons of sugar as against 894 tons for last year. For the former quantity 13,064 tons of cane were used, approximately taking 9·7 tons of cane to 1 ton of sugar. It might be mentioned in connexion with this factory that large alterations are contemplated, which if brought to a successful issue will influence the growing of sugar-cane in the southern part of the island to a very considerable extent.

AGRICULTURAL AND INDUSTRIAL EXHIBITION.

An extremely successful Agricultural and Industrial Exhibition was held on February 20 on the grounds of the Training School. The following report of this event is condensed from an account published in the *Agricultural News* of March 29 :—

'The lines adopted in the organization of the undertaking were similar to those followed in the case of the Exhibition for 1911. District sub-committees were constituted in the various parishes, and arrangements were made in each for disseminating information and for receiving entries.

'Despite the unpropitious character of the preceding season, a large number of entries were received prior to the opening of the show.

'At the time the Exhibition was opened, 1,214 exhibits had been staged.

'The show was opened by His Excellency Sir H. Hesketh Bell, K.C.M.G., at twelve o'clock noon.

'On the whole, the character of the exhibits was decidedly high.

'In the stock classes, the horses and cattle shown were fair while the asses were good and the mules excellent. The classes for small stock and poultry however, were somewhat poorly represented.

'In the classes for fruits and vegetables, and for sugar-cane and products, some fine exhibits were shown, and the standard reached both in the number and quality of the exhibits was surprisingly high in view of the past bad season.

'The class for cotton was also well represented, and a large number of exhibits of high quality appeared.

'A large and diversified series of exhibits appeared in the classes for plants and flowers which called for much admiration. Special mention must be made of the exhibits of roses in the section for cut flowers.

'A good series of specimens was seen on the class for preserves, whilst the class for miscellaneous exhibits was productive of a varied display of considerable interest.

'The classes for children's exhibits were fairly well represented, but the display of pot plants grown by children of the elementary schools was very disappointing. On the other hand, some excellent exhibits of vegetables grown in school gardens appeared.

'The exhibits shown in the class for collective displays of estate produce were of good quality, but it is regretted that greater competition was not evinced. This is probably attributable, however, to the past bad season.

'Special features of the show were the display by the island of Barbuda, and the exhibits of the Imperial Department of Agriculture, which in addition to a varied collection of experiment station produce, showed a number of exhibits illustrating a number of special points of local and general interest.'

Instruction in Agricultural Matters.

READING COURSES AND EXAMINATIONS.

During the year under review four candidates from Antigua presented themselves for examination in connexion with the Courses of Reading in Practical Agriculture of the Imperial Department of Agriculture. Of these, two sat for the Preliminary Examination, and two for the Intermediate. Two candidates had offered themselves for the Final, but for various reasons were unable to sit.

The examinations were held in October and November. The following gives the results of both:

PRELIMINARY.

Names.	Result.
A. Gallwey	2nd Class.
A. E. Peters	3rd „

INTERMEDIATE.

C. A. Gomes	1st Class.
E. H. Lake	2nd „

It will be remembered that the examination consists of oral as well as written tests. The local examiners for the Preliminary Examination were Messrs. H. A. Tempany and T. Jackson; for the Intermediate, Messrs. J. J. Roden, R. S. D. Goodwin, H. A. Tempany and T. Jackson.

CADET SYSTEM.

The cadet system has been working in a satisfactory manner in Antigua for a number of years. As mentioned on previous occasions these cadets after a period of training often take up the position of Junior and from this, that of Senior Assistant at the Botanic and Experiment Stations. In spite of the willingness and hard work of these juniors, the work of the Stations often suffers from lack of trained knowledge which necessitates unremitting attention to detail on the part of the senior officer. This position of affairs is made more acute on account of the fact that after the best of the labourers and gardeners at the Stations have received a limited amount of training, they leave unfortunately, as a rule, to emigrate to the United States.

A. Gallwey retained his post as cadet at the Government Laboratory, and A. E. Peters that at the Botanic and Experiment Stations.

Details of Administration.

EXPENDITURE.

The expenditure obtained from local funds for the year amounted to £865 19*s.* 9*d.*

In addition £24 19*s.* 3*d.* was spent on Special Services, the money being voted from lapsed Imperial balances. Of this £19 19*s.* 2*d.* was spent on nursery improvements and £5 0*s.* 1*d.* on books and various additions to the library at the Botanic Station.

The total receipts for the year amounted to £162 12*s.* 10*d.*

The receipts for sales of plants and seeds amounted to £70 7*s.* 3*d.*

STAFF CHANGES.

There were no changes in the staff during the year.

CORRESPONDENCE AND DISTRIBUTION OF INFORMATION ON AGRICULTURAL MATTERS.

Letters to the number of 447 were sent out during the year. In addition numerous notices, reports, etc., were distributed to planters and others.

Visits were made by the Curator to numerous estates and peasant holdings. These consisted of the routine visits to the various sugar-cane experiment stations situated in different parts of the island and visits in connexion with such crops as cotton, onions, coco-nuts, limes, etc. Advice and assistance were given when necessary.

OFFICIAL VISITS TO THE STATION.

His Excellency Sir H. Hesketh Bell, K.C.M.G., visited the Station on several occasions during the year.

The Hon. F. Watts, C.M.G., D. Sc., etc., Imperial Commissioner of Agriculture for the West Indies visited Antigua during the month of February. He accompanied His Excellency Sir H. Hesketh Bell on the occasion of the opening of the Agricultural Show, and visited the Experimental and Botanic Stations.

He also visited this island during the latter end of October. During his stay he addressed the Agricultural and Commercial Society and reviewed the agricultural condition of the island. He also, on this occasion visited various estates and the stations attached to the Department and advised on agricultural matters.

Mr. H. A. Ballou, M.Sc., Entomologist to the Imperial Department of Agriculture, visited the island to study various insect pests attacking crops.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, spent some considerable time in Antigua studying various diseases of farm animals, giving special attention to bovine tuberculosis.

Dr. Rose of the Smithsonian Institution of Botanical Research visited the Station on several occasions during a visit he made to Antigua.

Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands visited the Stations on numerous occasions during the year.

(Sgd.) T. JACKSON,

Curator.

METEORLOGICAL RETURNS.

RAINFALL AT THE BOTANIC STATION.

Month.	1912.	1911.	1910.	1909.	1908.	Average.
April	2·50	1·28	2·72	3·89	1·29	1·86
May	2·04	4·39	1·22	1·64	4·70	2·80
June	0·86	0·87	1·34	3·91	4·41	2·28
July	3·53	1·98	3·73	2·45	3·31	3·00
August	1·49	2·36	3·86	7·95	3·59	3·85
September	4·74	6·18	6·18	6·30	3·54	5·39
October	5·02	4·62	3·43	5·66	2·83	4·31
November	7·50	5·17	4·32	9·57	6·19	6·55
December	3·17	4·90	4·40	2·00	10·94	5·08
	1913.	1912.	1911.	1910.	1909.	
January	4·24	2·64	3·64	3·44	5·07	3·81
February	1·79	0·94	1·52	1·28	2·42	1·58
March	2·85	2·81	1·32	2·55	1·25	2·15
Total	39·73	38·14	37·68	50·59	49·54	42·66

METEORLOGICAL SUMMARY, 1912.

Month.	Thermometer.				Dew Point.		Maximum.	Minimum.	Barometer Corrected.		Wind.			Rainfall.	Barometer Corrected.		Therometer.	
	Dry.		Wet.								Miles run.	Average.			Highest.	Lowest.	Highest Maximum.	Lowest Minimum.
	9 a.m.	3 p.m.	9 a.m	3 p.m.	9 a.m.	3 p.m.			9 a.m.	3 p.m.		Per day.	Per hour					
January... ...	78·5	79·4	72·2	72·1	67·9	67·1	80·9	70·4	30·138	30·057	7,475	241·1	10·0	2·64	30·223	29·985	83	66
February ...	78·9	80 8	71·3	72·3	66·2	66·6	82·3	69·8	30·127	30·050	4,425	152·6	6·4	0·94	30·291	29·937	84	66
March	78·9	80·3	71·9	71·1	62·8	64·9	82·8	71·0	30·143	30·072	4,490	179·6	7·5	2·85	30·198	30·002	84	68
April	79·5	79·0	72·1	71·7	67·4	66·7	82·5	70·4	30·125	30·069	4,175	139·2	5·8	2·50	30·214	29·967	85	62
May	81·5	82·0	73·6	73.6	68·3	67·9	84·3	71·7	30·103	30·048	5,925	191·1	8·4	2·04	30·160	29·973	86	69
June	83·8	83·7	75·3	74·6	69·6	68·6	85·6	74·0	30·125	30·081	6,750	225·0	9·4	0·86	30·184	30·044	87	72
July	83·4	84·6	75·6	75·4	70·4	69·4	85·5	74·0	30·095	30·042	6,575	212·0	8·8	3·53	30·142	29·936	87	70
August	87·3	85·3	75·6	75·9	69·9	69·7	85·7	74·7	30·092	30·036	4,800	160·0	6·7	1·49	30·141	29·985	87	74
September ...	84·5	86·1	76·4	76·3	71·1	70·1	87·0	74·6	30·035	29·966	2,800	93·3	3·9	4·74	30·100	29·911	90	72
October	83·2	84·5	75·9	75·8	70·9	70·1	86·0	74·0	30·011	29·967	2,700	87·1	3·6	5·02	30·081	29·876	88	71
November ...	78·2	81·2	75·7	75·8	72·3	71·6	83 4	73 2	30·012	29·928	4,775	159·2	6·6	7·50	30·082	29·819	87	71
December ...	79·5	80·1	74·7	72·3	71·3	70·1	81·3	71·5	30·066	29·982	4,500	145·2	6·1	3·17	30·120	29·930	82	69
											59,390			37·28				
Means for the year. ...	81·4	82·3	73·4	73·9	69·0	68·5	83·9	73.3	30·088	30·025	4,948	165·5	6·9	3·11				

Highest Maximum Temperature 90° on 3rd and 26th September. Lowest Minimum Temperature on 14th April. Highest Barometer corrected 30·299 on 24th February. Lowest, Barometer corrected 29·819 on 7th November. Greatest Rainfall in 24 hours 2·49 on 6th October. Grt. No. Mls. run in 24 hrs. 324 m's. 14th January 22 and 28th February, 23rd June, 24 28, 29 July. Earthquakes recorded 7 on 8th February, 13th May, 2nd June, 20th June, 24th July, 5, 6 November.

Publications on Sale

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Volume XII. Nos. 1, 2, 3 and 4 :—Papers on the Agricultural Conference, 1912.
Volume XIII, No. 1. Containing Papers on COTTON AND AGRICULTURAL EDUCATION, prepared for the recent Agricultural Conference.
Volume XIII, No. 2.—Containing Papers on SUGAR-CANE EXPERIMENTS IN BRITISH GUIANA, prepared for the recent Agricultural Conference.
Volume XIII, No. 3.—Containing Papers on RUBBER AND MISCELLANEOUS SUBJECTS, prepared for the recent Agricultural Conference.
Volume XIII, No. 4.—Containing papers on the following subjects :—The Windward and Leeward Islands considered in relation to Forestry, by Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.; Stomatal Characteristics of Varieties of Sugar-cane, by W. R. Dunlop; Cane Syrups or Fancy Molasses, by H. A. Tempany, B.Sc., F.I.C.; Report on the Prevalence of Some Pests and Diseases in the West Indies during 1912, by H. A. Ballou, M.Sc.; Recent Trials with Cotton in Grenada, by Gilbert Auchinleck, B.Sc., F.C.S.; A Plea for Citrus Cultivation in St. Lucia, by A. J. Brooks, F.C.S.; The Tuberculin Test in the West Indies, by P. T. Saunders, M.R.C.V.S.

PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner, and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures up to 1909-10, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy-two. Those mentioned in the following list are still available; the rest are out of print :—

SUGAR INDUSTRY.

Seedling and other Canes at Barbados,
in 1900, No. 3, price 2*d*.; in 1901, No. 13, Price 4*d*.
n 1902, No. 19, price 4*d*. in 1903, No. 26, Price 4*d*.
in 1904, No. 32, price 4*d*.

Seedling Canes and Manurial Experiments at Barbados,
in 1903-5, No. 40, price 6*d*.; in 1904-6, No. 44, price 6*d*.
in 1905-7, No. 49, price 6*d*.; in 1906-8, No. 59, price 6*d*.
in 1907-9, No. 62, price 6*d*.; in 1908-10 No. 66, price 6*d*.

Seedling and other Canes in the Leeward Islands,
in 1900-1, No. 12 price 2*d*.; in 1901-2, No. 20, price 2*d*.
in 1902-3, No. 27, price 2*d*.; in 1903-4, No. 33, price 4*d*.
in 1904-5, No. 39, price 4*d*.; in 1905-6, No. 46, price 4*d*.
in 1906-7, No. 50, price 4*d*.; in 1907-8, No. 56, price 4*d*.
in 1908-9, No. 63, price 6*d*.; in 1909-10, No. 67, price 6*d*.

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